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Agricultural wheeled tractors — Steering requirements

Tracteurs agricoles à roues — Exigences relatives à la conduite

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 10998 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee ISO/TC 2, *Common tests*.

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Agricultural wheeled tractors — Steering requirements

1 Scope

This International Standard specifies performance criteria for normal and emergency steering modes for agricultural wheeled tractors having at least two axles fitted with pneumatic tyres; it does not apply to track-type or skid-steered agricultural tractors.

The requirements in this International Standard do not imply that additional devices are mandatory if the tractor energy source fails. However, if the tractor is equipped with these devices, then the requirements are mandatory.

NOTE 1 All wheels of the tractor may be steered wheels.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 789-11:—[1], *Agricultural tractors — Test procedures — Part 11: Steering capability of wheeled tractors.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 agricultural tractor: Self-propelled machine particularly designed to pull, push, carry and operate implements used for agricultural work (including forestry work).

3.2 steering equipment: All equipment needed to maintain or alter the direction of tractor movement.

3.2.1 steering control: That part directly operated by the driver to maintain or alter the direction of tractor movement.

3.2.2 steering-wheel: Type of steering control (3.2.1) that is generally round and alters the direction of movement by rotary motion.

3.2.3 steered wheels

(1) Wheels the alignment of which may be altered directly or indirectly in relation to the tractor in order to obtain a change in the direction of movement of the tractor.

(2) All wheels of articulated tractors.

(3) Wheels on the same axle, the speed of which may be varied in order to obtain a change in the direction of movement of the tractor.

3.2.4 steering gear: All the components between the steering control and the steered wheels, with the exception of the tractor energy source (3.2.5).

NOTE 2 The steering gear may be mechanical, hydraulic, pneumatic, electric or a combination of any of these.

3.2.5 tractor energy source: Part of the steering equipment which supplies additional or independent power to the steering system.

NOTE 3 Additional or independent power may be produced by any mechanical, hydraulic, pneumatic or electrical system, or by any combination of these (for example by an oil pump, air pump or battery, etc.).

3.3 Type of steering equipment

3.3.1 manual steering equipment: Equipment in which the steering power for the deflection of the steered wheels is provided solely by the muscular power of the driver.

1) To be published.

3.3.2 assisted steering equipment: Equipment in which the steering power for the deflection of the steered wheels is provided both by the muscular power of the driver and by the tractor energy source (3.2.5).

NOTE 4 Steering equipment where the steering power for the deflection of the steered wheels is normally provided solely by the tractor energy source (3.2.5) but which in the event of failure of the tractor energy source enables the muscular power of the driver to be used for steering, is considered as assisted steering equipment.

3.3.3 servo-steering equipment: Equipment in which the steering power for the deflection of the steered wheels is provided solely by the tractor energy source (3.2.5).

3.4 steering effort: Force applied tangentially to the average outside radius of the steering-wheel by the driver to steer the tractor.

4 General requirements

4.1 Steering-wheel

The steering-wheel shall be easy to use and grip. It shall be designed in such a way as to permit gradual deflection. The direction of movement of the top of the steering-wheel shall correspond to the desired change in the direction of the tractor.

4.2 Steering gear

4.2.1 The steering gear shall contain only mechanical parts or meet the provisions of this International Standard for mechanical steering gear which is assisted by hydraulic, electrical or pneumatic components. It shall be possible to steer the moving tractor even in the event of a failure of any of these assisting components.

The steering gear shall be so designed as to meet any operational requirements, and be easily accessible for maintenance and inspection.

4.2.2 Steering gear which is operated purely hydraulically and the tractor energy source defined in 3.2.5 shall meet the following requirements.

One or more pressure-limitation devices shall protect the whole or part of the circuit against excess pressure.

The pressure-limitation device shall be set so as not to exceed the maximum operating pressure p stated by the manufacturer.

The characteristics and dimensions of the conduits shall be able to withstand four times the maximum operating pressure p (permitted by the pressure-limitation devices), and shall be protected in places and arranged in such a way that the risk of damage by impact or interference are reduced to a minimum and where the risk of damage by rubbing can be considered negligible.

5 Steering performance requirements

The tractor shall be able to execute the steering manoeuvres specified in ISO 789-11 within the following limits.

5.1 For normal steering, the steering effort required to perform the test manoeuvres shall not exceed 250 N and the duration to achieve the specified turning radius shall not exceed 5 s.

5.2 For assisted steering equipment that is not connected to other equipment, if the tractor energy source fails, the steering effort required shall not exceed 600 N and the duration to achieve the specified turning radius shall not exceed 8 s.

5.3 For assisted steering equipment with a hydraulic connection between the hydraulic steering equipment and hydraulic braking equipment, if both are supplied from the same tractor energy source, and if either of the systems should fail, the steering effort required shall not exceed 400 N and the duration to achieve the specified turning radius shall not exceed 8 s.

6 Additional requirements for specific types of steering equipment

6.1 Assisted steering equipment

If the tractor is equipped with assisted steering equipment, it shall be possible to steer the tractor in the event that the tractor energy source fails. If the assisted steering equipment does not have its own source of power, it shall be fitted with a power reservoir. This power reservoir may be replaced by a self-contained device providing power supply to the steering equipment with priority over the other systems which are linked to the tractor energy source.

Where the steering power is normally provided solely by the tractor energy source defined in 3.2.5, the assisted steering equipment shall be fitted with a visual or acoustic signal which will warn if the tractor energy source has failed and the steering effort exceeds 250 N.

6.2 Servo-steering equipment

If the tractor is fitted with servo-steering equipment and provided that such equipment has a wholly hydraulic steering gear, then should the tractor energy

source fail, or a main engine failure cause the tractor energy source to be inoperative, it shall be possible to carry out the two manoeuvres specified in ISO 789-11 using a special additional device. The special additional device may be a compressed air or gas reservoir, or an oil pump or compressor with a dedicated power source. In the event of failure of the special additional device, a visual or acoustic signal shall give warning of such failure. A similar signal shall be provided for the special additional device to indicate the status (readiness) of the device during the tractor start-up process. The status indicator requirement does not apply where the special additional device is worked by the rotation of the tractor wheels and cannot be disconnected from them.

If the special additional device is pneumatic, it shall be fitted with a compressed air reservoir protected by a non-return valve. The capacity of the compressed air reservoir shall be calculated so that at least seven complete turns of the steering-wheel from full lock to full lock are possible before the reservoir pressure falls to half its operating pressure; this shall be tested with the steered wheels off the ground.

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